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Technical Report 485

THE EFFECTS OF REPEATED ENGAGEMENT SIMULATION EXERCISES ON INDIVIDUAL AND COLLECTIVE PERFORMANCE.

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SIMULATION SYSTEMS TECHNICAL AREA

U. S. Army

Research Institute for the Behavioral and Social Sciences

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This research measured individual and collective tactical performance in a series of engagement simulation exercises against novice opponents and with the same mission and terrain. The effects of engagement simulation training have been difficult to measure since training normally has been conducted with varying missions and terrain against a constantly improving opponent. The results of this research indicate that collective tactical performance

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is improved by repeated engagement simulation exercises. In the specific conditions tested, rifle squad members defending against a series of 15 rifle platoons in a movement-to-contact mission tended to suffer increased casualties when they caused more casualties. Squad members varied considerably among each other in terms of casualties produced. The squad collectively improved over time in their rate of producing enemy casualties, but did not improve in avoiding enemy fire. The squad collectively inflicted more casualties from some defensive positions than would be expected by chance.

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Simulation Systems Effectiveness

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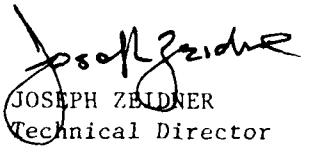
FOREWORD

In 1972, the Army Research Institute for the Behavioral and Social Sciences (ARI) initiated research which led to the development of a training method now known as tactical engagement simulation training. A tactical training environment has been created; however, definitive training guidance has not accompanied the training system. In order to provide effective training guidance, information is needed on the skills relevant to tactical performance on the modern battlefield and how these skills relate to one another. This research systematically investigated individual and collective tactical skill acquisition, holding constant the variables of terrain, mission, and skill of the opposition. The research was conducted in response to the requirements of Army Project 2Q162722A791 as a part of a larger program of research in tactical training for the Army Training and Doctrine Command (TRADOC).

The research was made possible through the active support of the 3d Infantry (Old Guard). Thanks are due to the officers and men of the Old Guard, especially CPT Dean Cash who served as senior controller for all field exercises and ensured that data collection procedures were followed. The following members of the research staff participated in the data collection effort: John J. Bosley, Frank King, Peter W.J. Onoszko, and Earl S. Stein. Finally, Robert G. Wanschura and Peter J. Paternoster contributed to the development and explication of the indices of collective performance.



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THE EFFECTS OF REPEATED ENGAGEMENT SIMULATION EXERCISES
ON INDIVIDUAL AND COLLECTIVE PERFORMANCE

BRIEF

Requirement:

To determine the effects of repeated engagement simulation exercises upon the performance of individuals and their small units against a series of novice opponents, keeping the terrain/mission constant. This is part of an effort to identify tactical skills related to successful combat mission performance and to determine the relationship among such variables and differing combat environments.

Procedure:

A rifle squad of nine men with a defensive mission established five positions in an area of 2000 by 200 meters. The squad was then opposed in a series of engagement simulation exercises by 15 different rifle platoons (average strength 30 men) with a movement-to-contact mission. The location of each squad member was recorded for each exercise, along with the casualties inflicted and incurred. Measures for individual and collective tactical performance were developed for the rifle squad.

Findings:

Individual soldiers tended to suffer increased casualities when they caused more casualties. The squad as a group became progressively more effective at inflicting casualties; however, they did not measurably improve in avoiding enemy fire. Different defensive positions contributed unequally to casualties inflicted.

Utilization of Findings:

The results provide evidence for a gradual improvement in collective tactical achievement during repeated trials, as measured by an index heavily weighting casualties inflicted. Army units should provide repeated opportunities for soldiers and small units to practice tactical skills during engagement simulation exercises.

THE EFFECTS OF REPEATED ENGAGEMENT SIMULATION EXERCISES ON INDIVIDUAL AND COLLECTIVE PERFORMANCE

CONTENTS

LIST OF TABLES

LIST OF FIGURES

THE EFFECTS OF REPEATED ENGAGEMENT SIMULATION EXERCISES ON INDIVIDUAL AND COLLECTIVE PERFORMANCE

INTRODUCTION

Tactical engagement simulation is a training method introduced into the Army in 1972 to stress the combat environment in which individuals and units must operate on the battlefield. Unlike "live fire" exercises (where the only enemy is a series of inanimate targets) or "blank fire" exercises (where firing effects are, at best, a subjective estimate by an umpire), engagement simulation provides a realistic and objective simulation of weapon effects and weapon signatures for two opposing sides in free-play exercises (Word and Root, 1977).

Experience in the field has shown that repeated engagement simulation exercises have produced improved tactical unit performance. Units receiving 3 weeks of engagement simulation training perform better than units receiving 1 week of engagement simulation training (Root, Epstein, et al., 1976). In a more recent test, rifle squads receiving 3 days of engagement simulation training demonstrated greater tactical proficiency than rifle squads receiving 3 days of conventional training (Banks, Hardy, Scott, Kress, & Word, 1977; Meliza, Scott, and Epstein, 1979; Scott, Banks, Hardy, & Sulzen, 1979). A similar test was conducted with tank platoons supported by TOW[1] antiarmor missile sections where the units received 5 days engagement simulation training and performed better than comparable units given 5 days of conventional training (Scott, Meliza, Hardy, Banks, & Word, 1979; Scott, Meliza, Hardy, & Banks, 1979).

The effects of training on individual and collective performance during the engagement simulation process have been difficult to measure. While both sides are improving, it is hard to measure the performance of one side--the same relative performance today may be an improvement over yesterday's performance because the opponent has also improved.

The missions assigned to training units have a definite effect on the outcome. Defenders have a decided advantage over attackers, according to Army doctrine (Department of the Army, 1976b) and research evidence (Root et al., 1976). The training transfer effect of one mission on another is unknown.

Engagement simulation training is typically conducted on varying terrain to enable the trainees to learn the specific techniques applicable to different terrain. Research has indicated that troops adapt to variations in the terrain by employing more long-range weapons in the open and more short-range weapons in the woods (Root and Erwin, 1976). Since terrain is often changed from exercise to exercise, it is difficult to determine whether performance improvements are attributable to repeated practice or terrain adaptive behavior.

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[1] Tube-Launched Optically-tracked Wire-guided

The research objective was to measure tactical skill acquisition while controlling opponent skill, tactical mission, and terrain.

METHOD

Subjects

The unit for investigation was a rifle squad formed to serve as the defending OPFOR (opposing force) against rifle platoons conducting movement-to-contact missions. The squad was made up of nine men ranging in rank from private first class to staff sergeant. The OPFOR squad was formed from a battalion scout platoon. During the course of the test, some men were absent and six substitutes from the battalion scout platoon filled in from one to four times.

The 15 rifle platoons serving as the opposition were receiving an external evaluation for the movement-to-contact mission (Department of the Army, 1976a). The fifteen platoons ranged in size from 22 to 37 men, with a mean of 30.53.

Procedure

The OPFOR squad prepared defensive positions and selected an observation post well forward of the main line of defense. The squad was instructed to defend in the same manner for each of the 15 different tested platoons. A Marine Corps platoon was run against the squad for two preliminary exercises during Week 1 to work out the exercise control procedures for the 15 platoons to be tested. Terrain was kept constant by using only one area, approximately 2000 m by 200 m of rolling and wooded terrain at Fort A.P. Hill, VA.

Each platoon arrived for testing at an assembly area at one end of the test lane, was given an engagement simulation briefing with the movement-to-contact mission order, and began the exercise. One mission was conducted each day for 3 consecutive days 1 week. Each exercise was conducted in accordance with engagement simulation procedures as outlined in the appropriate manual (US Army Infantry School, 1973). Controllers were trained to assess casualties based on the employment of the following weapons: rifles, machine guns, hand grenades, claymore mines, LAWs (Light Anti-tank Weapon), and mortar fire. There was one controller for each group of four to five men, as required by the engagement simulation procedures.

A net control station kept a casualty record sheet that noted each casualty, the time of the casualty, and the firer. A record was also kept of the mortar indirect fire missions requested by both sides, the number of rounds fired, and the casualties that were caused by indirect fire. Data collectors recorded the specific defensive location of each squad member during each exercise and the casualties inflicted and incurred. These data were then used to develop individual and collective tactical performance measures.

As part of the same test, additional data were colleted from the opposing rifle platoon units concerning the effects of leader board-game play on the initial engagement simulation exercise (Sulzen, Stein, and Jones, in preparation).

RESULTS

Individual Performance

The performance of each squad member was recorded for the 15 exercises during Week 2 through Week 6. The measures included the casualties that each squad member inflicted upon the attacking platoon, the number of times he became a casualty, and the number of times he participated in the 15 exercises (Table 1). Two measures of performance were developed for use with these data--mean casualties inflicted per participation, and mean casualties suffered per participation. Individual squad members varied considerably in the mean number of casualties inflicted per participation, with a range of .31 to 8.13 and a mean of 2.95. The mean casualties suffered had a range of .33 to .80 and a mean of .50.

Inspection of data on casualties inflicted (Table 1) reveals that five of the nine squad members (Individuals A through E) inflicted 87% of the casualties; six of the squad members (Individuals A through F) inflicted 94% of the enemy casualties. These six squad members inflicted at least two casualties per participation, while the remaining three squad members inflicted less than one.

One objective of combat operations is to maximize the effects of one's own weapons upon the enemy; the natural corollary is to minimize the effects of enemy weapons. Inspection of the casualties suffered per participation indicates that success in causing enemy casualties did not lead to success in avoiding enemy fire. In fact, there is a Pearson product moment correlation of .80 between casualties inflicted and casualties incurred (significant at the .01 level). In effect, the more enemy casualties produced by a squad member, the more likely he was to become a casualty himself.

Two individuals (B and F) were exceptions to this general rule. Although individuals B and F caused more than two casualties per participation, unlike the others in this category they suffered less than .5 casualties per participation. Both these men were non-commissioned officers (one was a sergeant, E-5, and the other was a staff sergeant, E-6).

Defensive Position

Inspection of casualty data related to defensive position suggested a differential effectiveness in defensive positions occupied (Table 2). Squad members in position 1 and 2 performed at about the expected rate (2.88 casualties inflicted per participation). However, performance at positions 3 and 4 was well below that rate, and performance at position 5 was well above it.

Table 1. Measures of Individual Squad Member Performance

Individual	Participations	Casualties Inflicted	Mean Casualties Inflicted per Participation	Casualties Suffered	Mean Casualties Suffered per Participation
A	15	122	8.13	12	.80
B	12	45	3.75	5	.42
C	15	51	3.40	8	.53
D	15	50	3.33	8	.53
E	13	41	3.15	8	.62
F	12	28	2.33	4	.33
G	11	8	.73	5	.45
H	15	8	.53	5	.33
I	13	4	.31	6	.46
Total	121	357		61	
Mean	13.44		2.95		.50

Table 2. Casualties Inflicted from Varying Defensive Positions

	Defensive Position					
	1	2	3	4	5	Total
Casualties inflicted	126	78	5	13	146	386[a]
Participations	44	30	17	26	17	134
Mean Casualties Inflicted per Participation	2.86	2.60	.29	.50	8.59	2.88[b]

[a]The total casualties inflicted differs from the total in Table 1 by 11 casualties which were due to six additional participants with 13 participations.

[b]The total mean casualties inflicted per participation differs from the total mean in Table 1 (2.95) due to six additional participants with a total of 13 participations and 11 casualties inflicted.

Figure 1 shows the defensive positions on a scale map with boundaries. Position 1 and 2 were on the defensive right side and forward. Positions 3 and 4 were on the defensive left and rearward. Position 5 was the observation post or OP and was well forward of the other positions in one of three locations. The barbed wire on both flanks of the main defensive positions served to funnel the attackers into the defensive position.

A chi-square analysis was made with the distribution of observed casualties inflicted from each position and the distribution of casualties inflicted that could be expected (Table 3). The chi-square analysis showed a significant difference between the distributions of casualties inflicted.

The members of the defending rifle squad differed considerably from each other in terms of casualties inflicted, as shown in Table 1. However, review of positioning data showed that most individuals occupied at least two different positions. One individual occupied all five positions, and his performance in casualties inflicted (Table 4) parallels the general pattern of casualties inflicted by all squad members as shown in Table 2 (position 5 > 1&2 > 3&4).

Table 5 provides data on the mean number of times a specific position or area was occupied by the defending rifle squad members. Although there were some constraints on the squad members, they were relatively free to occupy the positions as they chose. Table 5 indicates shifts in squad member position preferences.

Collective Performance

Two performance indices were developed for use on the casualty data. An "Achievement" index (Equation 1) considered casualties produced (by direct and indirect fire) and the number of persons in the exercise (minus personnel lost and self-inflicted casualties).

$$A_f = \frac{Cas_{en} + Cas_{eg}}{N_e - (Cas_{esi} + N_{el})} \quad (1)$$

where: A_f = Friendly achievement index

Cas_{en} = Enemy casualties from direct fire weapons

Cas_{eg} = Enemy casualties from indirect fire weapons

N_e = Total number of enemy personnel

Cas_{esi} = Self-inflicted enemy casualties

N_{el} = Total number of enemy personnel lost (uncertain as to location)

The defending rifle squad's Achievement index was calculated for each exercise, and then a mean was calculated for each week. Figure 2 shows the weekly mean Achievement index of the squad for six weeks. Three exercises

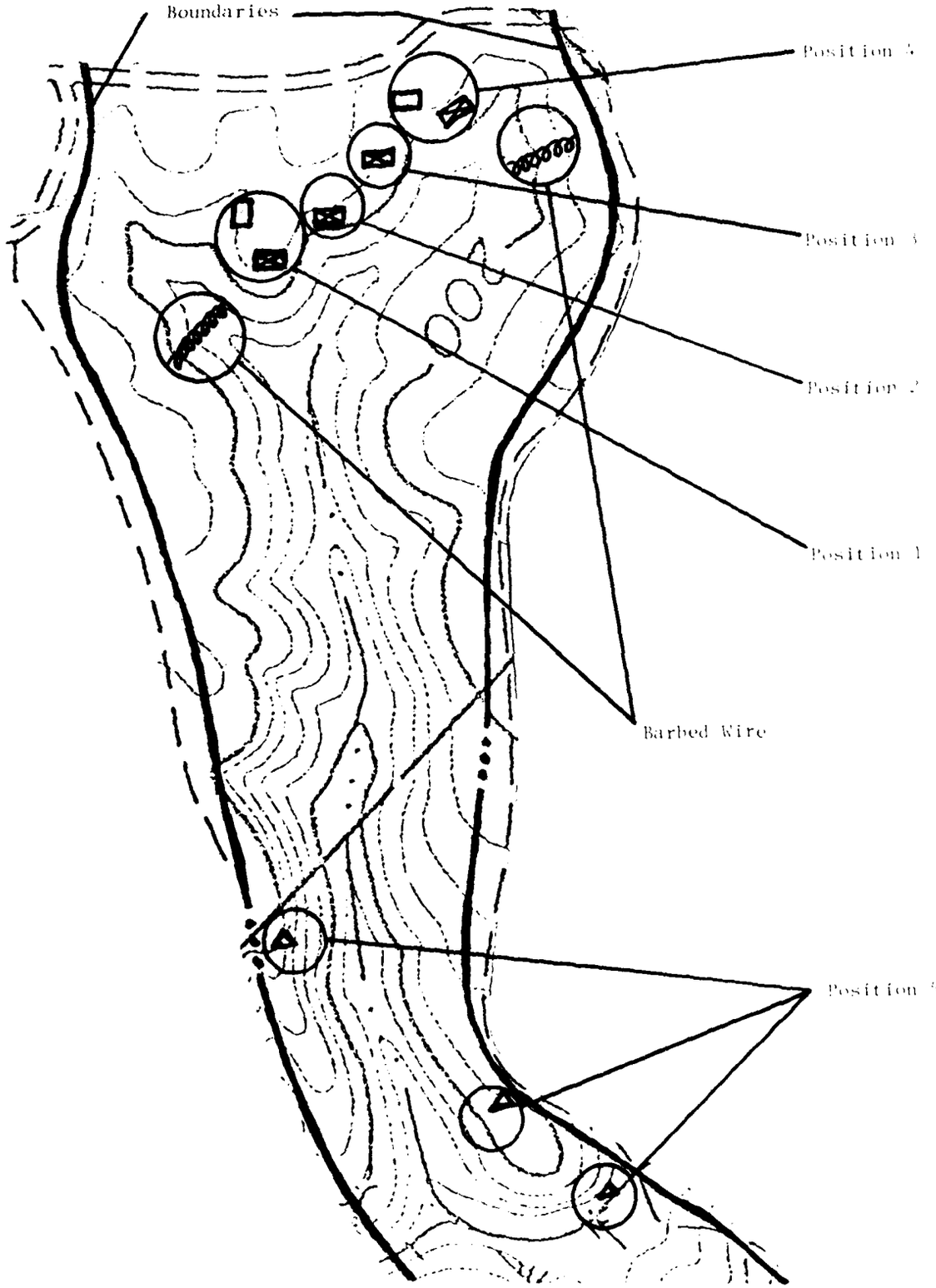

Figure 1. Defensive Positions

Table 3. Chi-Square Analysis of Expected and Observed Casualties Inflicted from Each Defensive Position

	Defensive Position[a]					
	1	2	3	4	5	Total
Expected Casualties[b]	126.72	86.40	48.96	74.88	48.96	385.92
Observed Casualties	116	78	5	13	146	386[c]

χ^2 = 283.77, $p < .001$

[a]An average of nine defenders occupied a series of defensive positions for 15 exercises with a differing number of participants in the five positions for each exercise (See Table 2).

[b]Expected casualties were determined by multiplying participants per position times the average casualties produced per participation (2.88). Data on 15 exercises for position and participation, in order, was as follows: 1, 44; 2, 30; 3, 17; 4, 26; 5, 17; total, 134.

[c]The total casualties inflicted differs from the total in Table 1 by 11 casualties which were due to six additional participants with a 2.2 participation rate.

Table 4. Casualties Inflicted by Individual E[a] from Varying Positions

	Defensive Position					
	1	2	3	4	5	Total
Casualties Inflicted	9	5	0	0	27	41
Participations	4	2	2	1	4	13
Mean Casualties Inflicted Per Participation	2.25	3.5	0	0	6.75	3.15

[a]Individual E was the only member of the defending squad to participate from all five positions.

Table 5. Weekly Mean Participation in Each Position

	Position[a]				
	1	2	3	4	5
Week 1	no data available				
Week 2	2.0	2.0	2.0	1.7	1.7
Week 3	3.0	2.0	1.7	1.3	1.0
Week 4	2.7	2.7	.7	2.0	1.0
Week 5	4.0	1.7	0	2.0	1.0
Week 6	3.0	1.7	1.3	1.7	1.0
Total Mean	2.9	2.0	1.1	1.7	1.1

[a]Total number of participants occupying a position during a week divided by the number of exercises in the week.

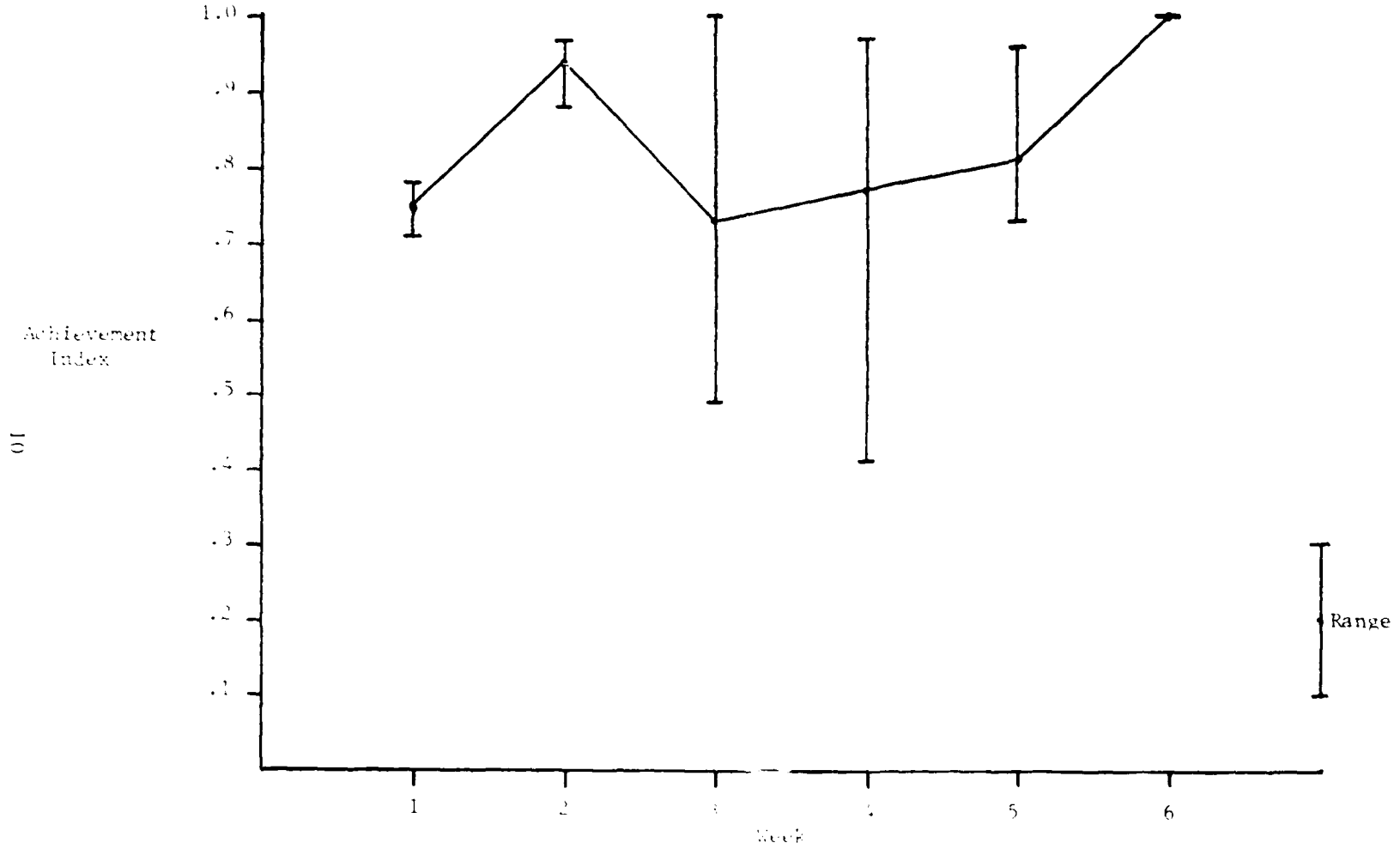

Figure 2. Weekly Mean Achievement Index for Defending Squad

were run per week except for the first week when the two preparatory exercises were conducted). With the exception of the second week, the mean Achievement index (Figure 2) shows a gradual improvement from .74 to 1.0 and demonstrates what appears to be collective improvement over time.

A second performance index, the "Conservation" index (Equation 2), considered the avoidance of casualties (total personnel less casualties from all causes) and personnel lost. Personnel lost or misoriented were not counted for or against the conserving unit since they were not direct battle losses.

$$C_f = \frac{N_f - (Cas_{fn} + Cas_{fg} + Cas_{fsi} + N_{fl})}{N_f - N_{fl}} \qquad (2)$$

where:
- C_f = Friendly conservation index
- N_f = Total number of friendly personnel
- Cas_{fn} = Friendly casualties from direct fire
- Cas_{fg} = Friendly casualties from indirect fire
- Cas_{fsi} = Self-inflicted friendly casualties
- N_{fl} = Total number of friendly personnel lost (uncertain as to location)

The defending rifle squad's Conservation index was calculated for each exercise, and then weekly means were calculated as shown in Figure 3. Although the Achievement index shows a gradual improvement over time, the Conservation index shows only a slight increase over time.

An index (Equation 3) was also developed for "Effectiveness," which is a function of both the Achievement and the Conservation indices. In the development of the Effectiveness index it was decided that there were two effects: one was due to Conservation and the second was due to the interaction of Conservation and Achievement. It was further decided that the two effects were additive. The Conservation effect was developed to be more valuable when there were fewer casualties; this was done by making the Conservation effect quadratic. For the interaction effect of Conservation and Achievement a change in Conservation was viewed as more important when levels of Achievement were higher. Therefore, a multiplicative relationship between change in Conservation and change in Achievement was chosen. The result is a larger product difference for higher Achievement levels than for lower Achievement levels. The effectiveness index is:

$$E = C^2 + CA \qquad (3)$$

where:
- E = Effectiveness
- C = Conservation as defined by Equation (2)
- A = Achievement as defined by Equation (1)

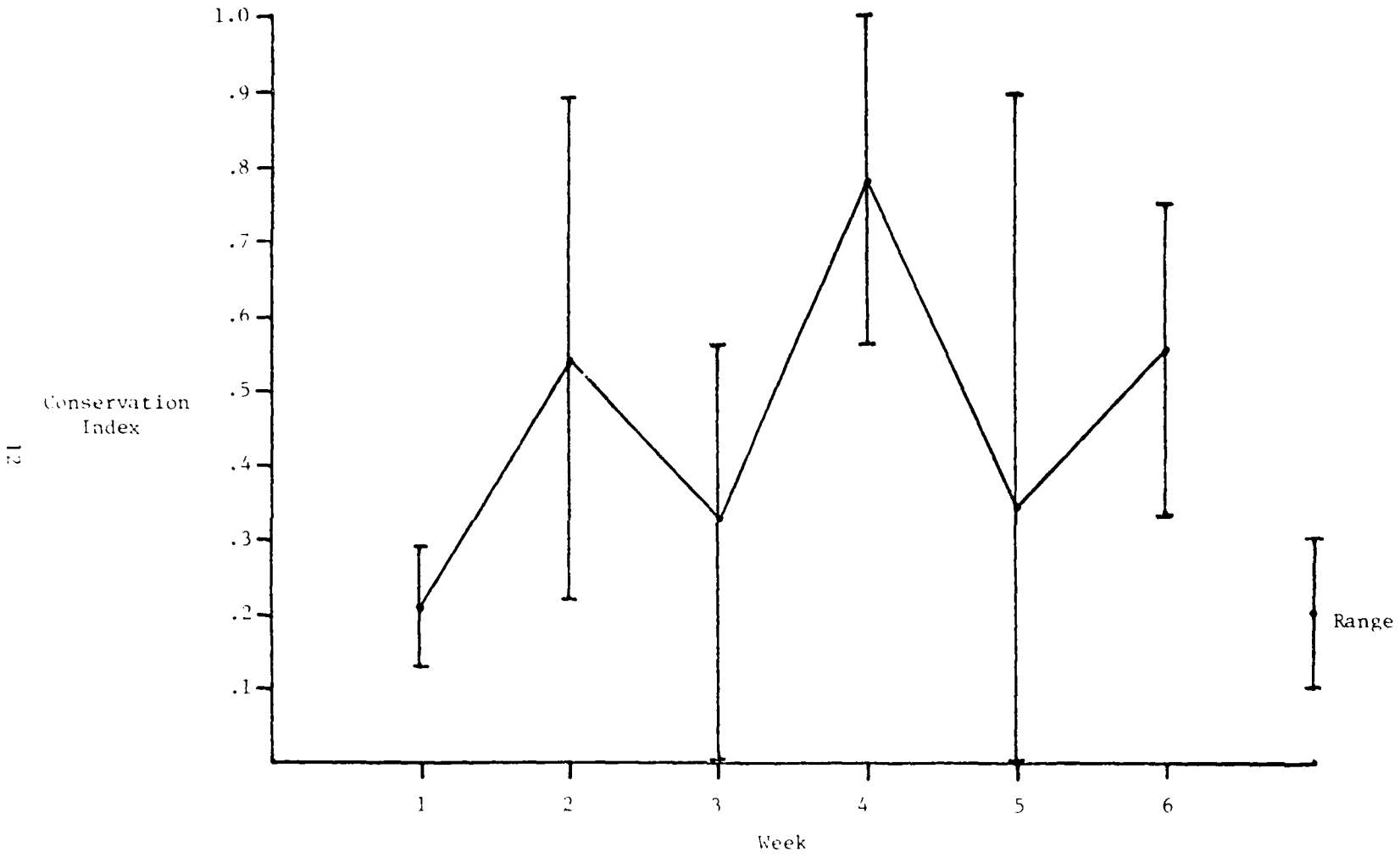

Figure 3. Weekly Mean Conservation Index for Defending Squad

The Effectiveness index was plotted by weekly mean for the defending rifle squad in the same manner as the Achievement and Conservation indices (Figure 4). Inspection shows that the Effectiveness plot closely follows the plot of the Conservation index.

DISCUSSION

The significant positive correlation between casualties inflicted and casualties suffered is not a militarily desirable relationship. A more desirable result would be a negative correlation indicating that increasing skill in causing casualties leads also to skill in avoiding casualties (as occurs with fighter pilot aces). A similar pattern appears in the collective measures of squad performance; the squad improves over time in terms of enemy casualties inflicted but shows no improvement in avoiding enemy fire. What leads to these results? It is possible only to speculate as to probable causes, such as insufficient or inappropriate training. If the training was insufficient, then additional training may produce an improved effectiveness index. If the training was inappropriate, what specific training practice was inappropriate? The training was repeated practice of engaging an opposing force. If continued practice reinforces incorrect behavior, it would seem logical to change some aspect of the stimulus situation. Engagement simulation provides an environment with realistic casualty assessment. However, the negative consequences of engagement simulation for the participants are no more severe than those of a basketball game. The negative consequences of combat, which engagement simulation seeks to model, are real, permanent, and dreaded by the participants.

Risk-taking behavior in games and in combat is moderated by the consequences. Although engagement simulation portrays combat casualty assessment, the results are mild and risk-taking behavior may differ from combat risk-taking behavior, invalidating the engagement simulation model. If the engagement simulation model is partially invalid, continued use of the model will produce some negative training (such as higher than usual risk taking behavior). If the engagement simulation training model has invalid aspects that produce negative training, those aspects need to be changed. A technique to improve conservation might be to reward individual and collective conservation or survivability while punishing inappropriate or high risk-taking behavior. Successful unit performance, as measured by the Effectiveness index developed here, will increase the number of survivors during combat simulation, better enabling the unit to continue the mission.

The differential effectiveness of the defensive positions, measured by casualties inflicted, in the reported results may be caused by a number of factors. One factor might be the actions of the opposing side (such as moving primarily toward one side of the defense). This possibility is supported by the fact that most attacking platoons approached past position 5 (the observation post) toward positions 1 and 2. Further support for the contention that positions occupied provide differing opportunities to inflict casualties may be seen in Table 5, which reflects an unobtrusive measure of squad member position preference. After position 5 was occupied by two men in

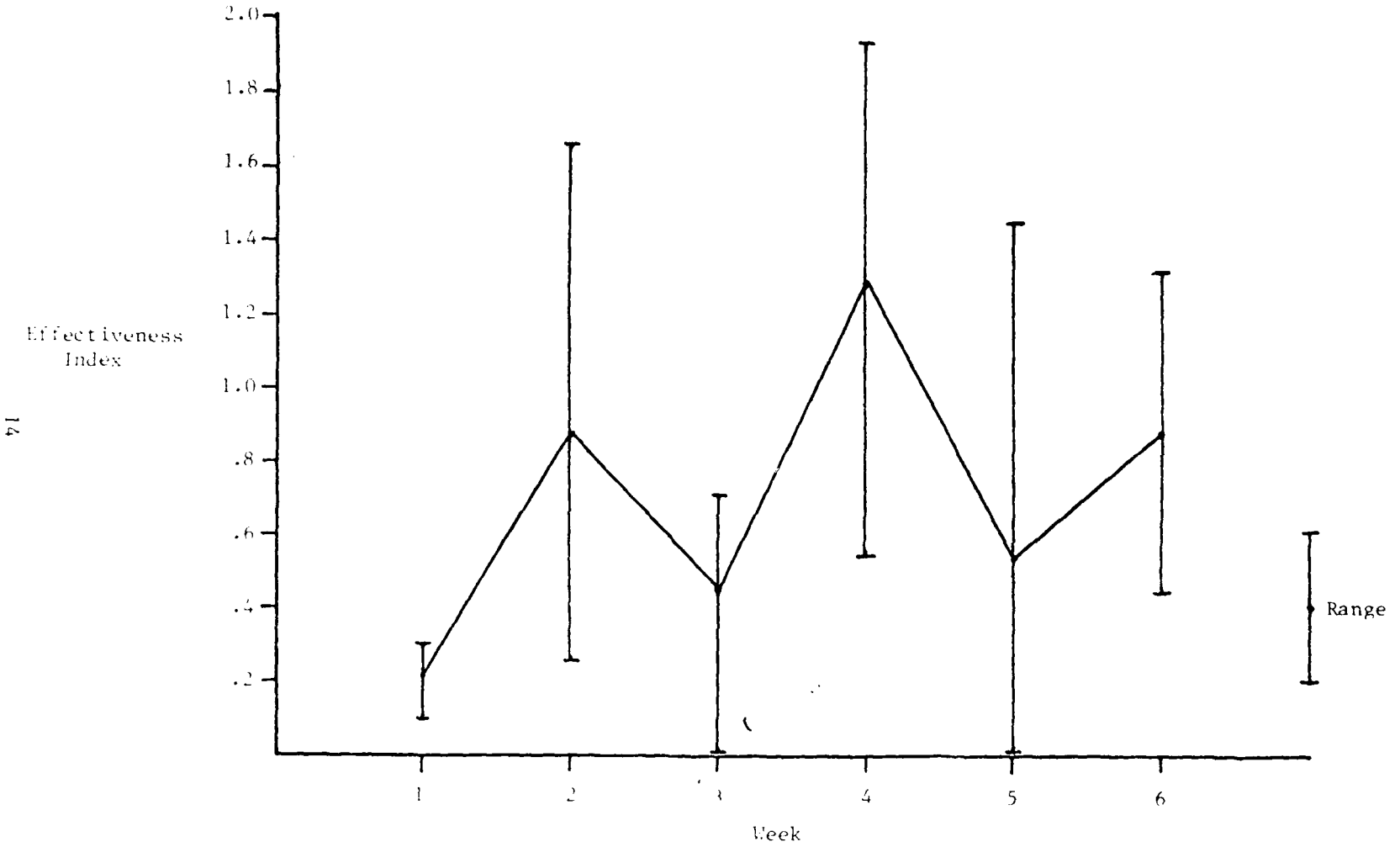

Figure 4. Weekly Mean Effectiveness Index for Defending Squad

the first two exercises, the exercise director ordered that the position be occupied by only one man. The other four positions were occupied at the discretion of the squad. A logical distribution would be two men to a position (as was the mean distribution during Week 2). However, during subsequent weeks, soldiers showed a greater preference for positions 1 and 2. Assuming that soldiers wanted to inflict more casualties, their preference for positions 1 and 2 may reflect a preconceived effectiveness attributed to these positions.

The shift in squad member participation between Week 6 and Week 6 (Table 5) shows a trend away from position 1 back toward position 3. During Week 5 the defending squad suffered more casualties from indirect fire (mortars) than in any other week. Many of these casualties were suffered around position 1. Only two squad members at position 1 could get inside the bunker with its added protection from indirect fire. The additional squad members around position 1 could not get into the bunker and were more exposed to enemy observation and fire (both direct and indirect). The shift away from position 1 during Week 6 following the heavy casualties of Week 5 is a possible demonstration of adaptive behavior by the defending squad.

Another reason for differential defensive effectiveness may be the individual skills of the soldiers occupying specific positions (although, as previously noted, most men occupied at least two different positions, and the one who occupied all positions had a pattern of success that followed the collective pattern).

A final possible cause for squad members inflicted more casualties from some defensive positions than from others could be the military aspects of the terrain (such as observation, fields of fire, cover and concealment). Assuming the military aspects of the terrain have an effect, it should be possible to predict differential success in advance.

The results of this study provide evidence for a gradual improvement in maximizing enemy casualties (achievement) by a tactical unit repeating the same mission on the same terrain while being opposed by novice units. Measures of individual and collective tactical performance have been developed. The study provides evidence that continued practice in the current combat simulation does not necessarily improve soldiers' ability to survive. Also, different defensive positions, for a variety of possible reasons, contribute unequally to casualties.

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1 1ST INFANTRY DIVISION AND FT. RILEY ATTN: AFZN-OPT-T
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2 HQ TRADOC TECHNICAL LIBRARY
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1 MILITARY OCCUPATIONAL DEVELOPMENT DIRECTORATE ATTN: ATZI-NCR-MS-M, RM 3N33 HOFFMAN BLDG II
1 DATA ANALYSIS DIVISION ATTN: ATZI-NCR-MD, HOFFMAN BLDG II
1 USA MILPERCEN ATTN: DAPC-POU-T
1 8TH INFANTRY DIVISION
1 HQDA ARMY FORCE MODERNIZATION COORDINATION OFFICE
1 HQDA ATTN: DAS5-PTM
1 NAVAL AIR SYSTEM COMMAND
1 1230 USARCOM RESERVE CENTER
1 US ARMY SOLDIER SUPPORT CENTER ATTN: ATSG-HDD (DR. CAVINESS)
1 USA FORCES COMMAND AFLG - DEPUTY CHIEF OF STAFF FOR LOGISTICS
1 DIRECTORATE OF TRAINING ATTN: ATZQ-T
1 DIRECTORATE OF COMBAT DEVELOPMENTS ATTN: ATZQ-D
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22 ARI LIAISON OFFICE
1 7TH ARMY TRAINING COMMAND
1 HQDA, DCSOPS UNIT TRAINING
1 HQDA, DCSOPS TRAINING DIRECTORATE
1 HQDA, DCSLOG MAINTENANCE MANAGEMENT
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1 USACDEC ATTN: ATEC-EX-E HUMAN FACTORS
1 ATTN: SM-ALC/DPCR
1 OASA (RDA) DEPUTY FOR SCIENCE AND TECHNOLOGY
1 OFC OF NAVAL RESEARCH /
1 AFHRL/LRT
1 AFHRL/LRLG
1 AIR FORCE HUMAN RESOURCES LAB ATTN: AFHRL/TSR
1 AFAMRL/HB
1 NAVY PERSONNEL R AND D CENTER DIRECTOR OF PROGRAMS
1 NAVY PERSONNEL R AND D CENTER /
2 OFC OF NAVAL RESEARCH PERSONNEL AND TRAINING RESEARCH PROGRAMS
1 NAVAL PERSONNEL R & D CENTER /
1 OFC OF NAVAL RESEARCH PROJECT OFFICER, ENVIRONMENTAL PHYSIOLOGY
1 OFC OF NAVAL RSCH ORGANIZATIONAL EFFECTIVENESS PRO.
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1 NAVAL AEROSPACE MEDICAL RSCH LAB AEROSPACE PSYCHOLOGY DEPARTMENT
1 USA TRADOC SYSTEMS ANALYSIS ACTIVITY ATTN: ATAA-TCA
1 HEADQUARTERS, COAST GUARD CHIEF, PSYCHOLOGICAL RSCH BR
1 USA RESEARCH AND TECHNOLOGY LAB ATTN: DAVDL-AS (DR. R. S. DUNN)
1 USA ENGINEER TOPOGRAPHIC LABS ATTN: ETL-GSL
1 USA MOBILITY EQUIPMENT R AND D COMD ATTN: DRDME-TQ (SCHOOL)
1 NIGHT VISION LAB ATTN: DRSEL-NV-SDD
1 USA TRAINING BOARD ATTN: ATTG-ATB-TA
1 USA HUMAN ENGINEERING LAB
1 USA MATERIEL SYSTEMS ANALYSIS ACTIVITY ATTN: DRXSY-C
1 USA ARCTIC TEST CEN ATTN: AMSTE-PL-TS
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1 USA CONCEPTS ANALYSIS AGCY ATTN: CSCA-RQP
1 USA CONCEPTS ANALYSIS AGCY ATTN: CSCA-JF
1 USACACDA ATTN: ATZL-CAC-IC
1 USACACDA ATTN: ATZL-CAC-IM
1 USACAC ATTN: ATZL-CAC-IA
1 USACACDA ATTN: ATZL-CAC-A
1 USA RSCH DEVEL + STANDARDIZA GP, U.K.
1 USA RESEARCH AND DEVELOPMENT LABS CHIEF, BEHAV SCIENCES DIV, FOOD SCI LAB
1 TRADANA ATTN: SAJS-OR
1 NAVAL AIR SYSTEMS COMMAND ATTN: AIR-5313
1 USACDEC TECHNICAL INFORMATION CENTER
1 USAARL LIBRARY
1 USA TRADOC SYSTEMS ANALYSIS ACTIVITY ATTN: ATAA-SL (TECH LIBRARY)
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1 USA COMPUTER SYSTEMS COMMAND ATTN: COMMAND TECHNICAL LIBRARY H-9
1 GRONINGER LIBRARY ATTN: ATZF-RS-L BLDG 1313
1 CENTER FOR NAVAL ANALYSIS
1 NAVAL HEALTH RSCH CEN LIBRARY
1 NAVAL PERSONNEL R AND D CEN LIBRARY ATTN: CODE P106
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1 HQ, FT. HUACHUCA ATTN: TECH REF DIV
1 USA ACADEMY OF HEALTH SCIENCES STIMSON LIBRARY (DOCUMENTS)
1 SCHOOL OF SYSTEMS AND LOGISTICS /
1 DEPARTMENT OF THE NAVY TRAINING ANALYSIS AND EVALUATION GP
1 USMA DEPT OF BEHAVIORAL SCI AND LEADERSHIP
1 USA COMMAND AND GENERAL STAFF COLLEGE ATTN: LIBRARY
1 USA TRANSPORTATION SCHOOL USA TRANSP TECH INFO AND RSCH CEN
1 USA ADMINCEN TECHNICAL RESEARCH BRANCH LIBRARY
1 USA FIELD ARTY BD /
1 INSTITUTE FOR DEFENSE ANALYSES
1 USA TRAINING SUPPORT CENTER ATTN: ATIC-DST-PA
1 AFHRL TECHNOLOGY DEC (H)
1 USA MOBILITY EQUIPMENT R AND D COMMAND ATTN: DRDME-ZG
1 DA US ARMY RETRAINING BDE RESEARCH + EVALUATION DIVISION
1 US MILITARY ACADEMY DEPT. OF HISTORY, BLDG 601
1 MARINE CORPS INSTITUTE
1 NAVAL SAFETY CENTER /
1 USAAVNC AND FT. RUCKER ATTN: ATZQ-ES
1 US ARMY AVN TNG LIBRARY ATTN: CHIEF LIBRARIAN
1 USA AIR DEFENSE SCHOOL ATTN: ATSA-DT
1 USAAVNC ATTN: ATZQ-D
1 US MILITARY ACADEMY DIRECTOR OF INSTITUTIONAL RSCH
1 USA AIR DEFENSE SCHOOL ATTN: ATSA-CD-MS
1 USAADS-LIBRARY-DOCUMENTS
1 USA AIR DEFENSE BOARD ATTN: FILES REPOSITORY
1 USA INFANTRY BOARD ATTN: ATZB-IB-AE
1 USA INTELLIGENCE CEN AND SCH ATTN: ATSI-DOTD-SF
1 USA ORDNANCE CEN AND SCH ATTN: ATSL-TD-TAC
1 USA ARMOR SCHOOL ATTN: ATZK-TD
1 USA ARMOR CENTER DIRECTORATE OF COMBAT DEVELOPMENTS

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1 USA TRANSPORTATION SCHOOL DEPUTY ASST. COMMANDANT EDUCA. TECHNOLOGY
1 USA SIGNAL SCHOOL AND FT. GORDON ATTN: ATZH-ET
1 USA QUARTERMASTER SCH ATTN: ATSM-TNG-IM-ET
1 USA MILITARY POLICE SCHOOL ATTN: LIBRARY
1 USA ARMOR CENTER & FT. KNOX OFFICE OF ARMOR FORCE MGT & STANDARDIZATION
1 CHIEF OF NAVAL EDUCATION AND TNG /
1 USA SIGNAL SCHOOL & FT. GORDON EDUCATIONAL TECHNOLOGY DIVISION
1 HQ ATC/XPTD TRAINING SYSTEMS DEVELOPMENT
1 USA INSTITUTE FOR MILITARY ASSISTANCE ATTN: ATSU-TD-TA
1 USAISD ATTN: ATSIE-DT
1 US ARMY ARMOR CENTER ATTN: ATZK-TD-PMO
1 USA AIR DEFENSE CENTER, FT. BLISS ATTN: ATZC-DIM
1 USA QUARTERMASTER SCHOOL DIRECTORATE OF TRAINING DEVELOPMENTS
1 US COAST GUARD ACADEMY /
1 USA TRANSPORTATION SCHOOL DIRECTORATE OF TRAINING & DOCTRINE
1 USA INFANTRY SCHOOL LIBRARY /
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1 US ARMY INFANTRY SCHOOL ATTN: ATSH-CD
1 USA INFANTRY SCHOOL ATTN: ATSH-DOT-LRD
1 USA INFANTRY SCHOOL ATTN: ATSH-EV
1 USA MP & CHEM SCH/TNG CEN & FT. MCCLELLAN ATTN: ATZN-PTS
1 USA MP & CHEM SCH/TNG CEN & FT. MCCLELLAN DIR. COMBAT DEVELOPMENT
1 USA MP & CHEM SCH/TNG CEN & FT. MCCLELLAN DIR. TRAINING DEVELOPMENT
1 USA MP & CHEM SCH/TNG CEN & FT. MCCLELLAN ATTN: ATZN-MP-ACE
1 USA INSTITUTE OF ADMINISTRATION ATTN: RESIDENT TRAINING MANAGEMENT
1 USA FIELD ARTILLERY SCHOOL MORRIS SWETT LIBRARY
1 USA INSTITUTE OF ADMINISTRATION ACADEMIC LIBRARY
1 USA WAR COLLEGE ATTN: LIBRARY
1 USA ENGINEER SCHOOL LIBRARY AND LEARNING RESOURCES CENTER
1 USA ARMOR SCHOOL (USARMS) ATTN: LIBRARY
1 US COAST GUARD ACADEMY LIBRARY
1 USA TRANSPORTATION SCHOOL TRANSPORTATION SCHOOL LIBRARY
1 ORGANIZATIONAL EFFECTIVENESS CEN & SCH ATTN: LIBRARIAN
1 US ARMY INTELLIGENCE CENTER & SCHOOL ATTN: ATSI-TD
1 US ARMY INTELLIGENCE CENTER & SCHOOL ATTN: ATSI-RM-M
1 USA FIELD ARTILLERY SCHOOL DIRECTORATE OF COURSE DEV & TRAINING
1 DEPARTMENT OF THE AIR FORCE AIR UNIVERSITY LIBRARY (ATC)
1 HQ TRADOC TRAINING DEVELOPMENT INSTITUTE
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2 CANADIAN JOINT STAFF
1 CDLS (W) LIBRARY
1 FRENCH ARMY ATTACHE
1 AUSTRIAN EMBASSY DEFENSE, MILITARY AND AIR ATTACHE
3 CANADIAN DEFENCE LIAISON STAFF ATTN: COUNSELLOR, DEFENCE R AND D
1 ROYAL NETHERLANDS EMBASSY MILITARY ATTACHE
1 CANADIAN FORCES BASE CORNWALLIS ATTN: PERSONNEL SELECTION
2 CANADIAN FORCES PERSONNEL APPL RSCH UNIT
1 ARMY PERSONNEL RESEARCH ESTABLISHMENT
6 LIBRARY OF CONGRESS EXCHANGE AND GIFT DIV
1 DEFENSE TECHNICAL INFORMATION CEN ATTN: DTIC-DDA-2
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1 US GOVERNMENT PRINTING OFC LIBRARY, PUBLIC DOCUMENTS DEPARTMENT
1 US GOVERNMENT PRINTING OFC LIBRARY AND STATUTORY, LIB DIV (SLL)
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